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The second Paper read was—

2. *Journey from Little Namaqualand Eastward along the Orange River, the Northern Frontier of the Colony, &c. With Map.* By Mr. Robert Moffat, F.R.G.S.

Communicated by the Colonial Office.

[This Paper will be printed in full in the Journal with Map.]

The position of Gams, Mr. Moffat's starting-point, was obtained by a running triangulation from Mr. Maclear's northernmost beacons. For the rest, his latitudes were obtained from stars on either side of the zenith, and his bearings by a theodolite, but the state of his chronometer precluded any observations for longitude. His survey has fixed the lateral limits of the course of the Orange River, and determined certain special points, such as the mouths of the Aintas and the Hartebeest Rivers.

The physical geography of the Orange River district is described in detail. Mr. Moffat considers that a substratum of metamorphic rock extends in a basin from about longitude 20° 30′ to longitude 25°; its lowest point being at longitude 22° 30′. That this rock was formerly covered by a thick sandstone deposit, now so largely denuded that little remains to attest its existence on the western side of the basin, except the Noup plateau, to which he ascribes a height of about 4000 feet. The hills adjacent to it are formed by protruded greenstone, and certain depressions in this basin are filled with deposits of later dates. Many geological particulars are also given of the country onwards towards Kuruman, and the features of the great cataract of the Orange River are minutely described. Mr. Moffat remarks, in such of the horizontal formations of South Africa as he has examined, that the volcanic rocks have simply had the effect of hardening those parts of the strata they have pierced. A result of this is, that all outliers of plateau ranges composed of these rocks possess a backbone or capping of basalt, which has enabled them to withstand those denuding forces which have removed the area formerly adjoining to them.—F. G.

The President begged to return the thanks of the Meeting to Mr. Moffat, and appealed to Dr. Livingstone to state what he knew of the region described by his brother-in-law.

Dr. Livingstone, F.R.G.S.—The country is of a very arid, sterile character; but the paper is chiefly interesting from the fact of his having visited the Falls. They were visited about the year 1815 by the Rev. John Campbell; but he did not go so far down as to have a distinct view of the chasm into which the waters of the Orange River flow. But I think he states that he threw a large stone down into the chasm, and that it was a long time before it reached the bottom. This chasm seems to be of exactly the same nature as the fissure into which the Zambesi flows, forming the remarkable Falls called by me the Falls of Victoria. When I was in the country to the east of that, adjacent to Kuruman, I saw evidences everywhere that this country was at some former period much better watered than it is now. Everywhere you see the remains of ancient river beds, in which you find shells, washed sand, and rolled boulders, showing that at some former period they had been large, never failing streams. On one occasion I followed the course of a very large river, flowing from the north to the south. All the feeders of that stream came in a slanting direction, and it could be easily seen that the river flowed from north to south, the same as the Zambesi does at a part of its course. At last I came to the confluence of that ancient river with a large lake near to where the Orange River now flows. At the confluence there were a few hills. These hills must have caused an eddy in the stream; and in that eddy a mound of tufa—soft white limestone—must have been deposited. I examined that mound, and to my delight found a great mass of the fossil bones of animals that had lived on dry land and had happened to be killed in the water; and in floating down and coming to the eddy had evidently been carried round and round, and then sunk. The tufa had been worn away a little, and the bones were standing out in relief. I allowed my waggon to go a long distance off, and took up a few of the bones and ran after it. It was only seven years afterwards that I was able to return, but I was prevented from taking out more of the bones; those I had secured I sent to my friend Professor Owen. They were brought safely to England, and then they were stolen from the railway between Devizes and London. I never had another opportunity of getting hold of those bones. If any future traveller happens to go that way, I beg him not to forget them. Now, that large lake was let out when the fissure was formed into which the Orange River now flows. You observe in the map that the lake spreads out before it comes to the fissure; in former times, instead of being spread out in that way, it extended over a diameter of at least 50 miles. The state of Africa was then very different from what it is now. Before the fissures were made which let out the rivers and lakes adjacent to them, the extent of water in the interior of Africa must have been enormous. A process of desiccation has gone on, and there are evidences of the gradual drying up of the country. I may mention one instance observed by myself. When the missionaries first went into the Kuruman, about 35 years ago, Mr. Moffat made a dam and a canal to irrigate a garden. Not a drop of water now flows down so far as where I have seen the remains of the dam and canal. In former times the Kuruman came all the way down to the Orange River; and there are persons now living who can remember when hippopotami existed in the Kuruman, where not a drop of water now flows, and where people have been drowned. This process of desiccation has been going on more rapidly in recent times than before. The elevation of the country is probably one great cause of desiccation, but the sudden destruction of trees in late years has, no doubt, had a very decided effect upon the climate. Thousands of acres of grass are burned up annually, and every tree, not in the greatest vigour, is burned down too. In Colesberg, during the time I was there, the river dried up entirely. We ourselves made a dam and canal in the hope of growing European vegetables through the irrigation thus afforded; but the river dried up, and by-and-bye we were obliged to dig in the bed of the river for drinking purposes. Water has not again flowed in the Colesberg. When Mr. Moffat visited that country thirty years ago, he found about a dozen streams flowing that now never flow. The drying up is apparently going on towards the north.

MR. W. J. HAMILTON, F.R.G.S.—Amongst the many persons who have given us information with respect to the physical geography of the interior of Africa, there is no one who has contributed so much as Dr. Livingstone himself. It is for this reason that I venture to ask one question respecting the physical structure of the country to which he has alluded. It is a point which to many persons in this room must be of great interest. I wish to ask, with regard to the occurrence of these fossil bones in the fissure which he describes as forming the outlet to the waters of the Orange River on the west, as the fissure through which the Zambesi flows has afforded an outlet to the waters on the east, whether the formation in which these bones occur may not have been one of the original rocks of the country, instead of being formed, as he states, by the eddy of the waters themselves? There seemed to me, from the manner in which he described these bones as occurring in the deposit, evidences rather of its being the original formation of the country, and that the bones had been washed out of this deposit and not washed into it by the eddy. It is a question of great importance in a geological point of view, whether they were washed in by the water at a recent period, or whether the deposit belonged to the original soil of the country, and had been merely laid bare by the action of the water flowing through this fissure? If Dr. Livingstone could give any information on the subject, it would, I think, be very interesting.

DR. LIVINGSTONE.—The bones were not found in the fissure. The fissure is altogether distinct from the part where the bones were found. The fissure was made at the side of the large lake, and it let out the water. There was a river which flowed from the northern part of the country, and about 100 miles to the north-east of the fissure, it fell into the lake. It was at the confluence of the river with the lake and not near the fissure that the mound was formed. It might be that the water of that ancient river had excavated the bones out of the country beyond. The general character is trap, which for hundreds of miles is perfectly flat; and over this trap we have a deposit of soft white tufa. We find this tufa deposited in considerable quantities in ancient fountains and wherever ancient streams have flowed. If the mound was formed of any other substance, say the detritus of the trap, then we might conclude that the bones had been excavated out of the banks of the river and deposited there. But the bones are found in the tufa deposited by the water, and as the tufa came from the water I imagine the bones came from the water after having floated down.

MR. W. J. HAMILTON.—I think from the explanation of Dr. Livingstone, it would appear that the bones are of a much more ancient formation than his first description of them would have led us to suppose. His first impression was that they were washed by the waters into the eddy, whereas by his present account it appears that they were pre-existing, and were merely washed out or exposed by the action of the water.

DR. LIVINGSTONE.—I imagine the tufa was deposited in the eddy of the waters, and these bones, floating down, were deposited in the tufa; then the weather wore away the tufa and exposed the bones. Some of the bones had fallen down to the bottom of the mound. But all would be cleared up if some geologists would go there and examine the mound.

The PRESIDENT.—I beg to say that I completely understand the nature of the question put by Mr. Hamilton, and of the answer of Dr. Livingstone. I have not conversed with my friend respecting the structure of the interior of Africa without being completely cognisant of what he meant. If I understand him aright, there was a period when a large region of the interior was occupied by waters that have now been let off. The animals which inhabited the banks of the broader and deeper waters at that period have perished, and their bones have been deposited in this tufa. That tufa being desiccated, bones have been found in it.

DR. LIVINGSTONE.—The bones are found in a mound.

The PRESIDENT.—Very well: the bones are found in a mound which has been formed out of these tufaceous deposits. I perfectly understand Dr. Livingstone, who has given a very fair and rational explanation of the whole phenomenon. I am glad Mr. Hamilton asked the question, in order that we should completely understand the case.

The PRESIDENT, in calling attention to the next subject on the paper, "The Preparations for the Departure of the Livingstone Expedition," reminded the Society that this was probably the last occasion they would have of meeting the distinguished traveller in that room. He then read the following Letter agreed to by the Council of the Society: *

To the Earl of Shelburne, Under Secretary of State for Foreign Affairs.

15, Whitehall Place, 13th January, 1858.

MY LORD,—In reply to your letter of the 19th December last, in which, by the desire of Lord Clarendon, you ask the Council of the Royal Geographical Society to furnish his Lordship with any suggestions they may have to make in respect to the scientific portion of the labours of the expedition of Dr. Livingstone, I beg to offer the following statement.

At the last Meeting of the Council, held on Monday last, your Lordship's letter was read, and Dr. Livingstone was then called upon to explain his own views and wishes. Thereon he informed us as to the proposal which he had sent in to Lord Clarendon, after consultation with those men of science on whom he could best depend.

Having duly considered the subject, the Council passed the following Resolutions unanimously :—

1. The Council of the Royal Geographical Society having received from Dr. Livingstone an account of the proposal made by him to the Earl of Clarendon in reference to the expedition up the Zambesi river, beg to express their entire approbation of the project and of the persons recommended to be the scientific companions of the leader—these persons being Commander N. B. Bedingfeld, F.R.G.S., Dr. J. Kirk, F.R.G.S., as naturalist, Mr. R. Thornton as mining geologist, Mr. Thos. Baines, F.R.G.S., as artist, draughtsman, and storekeeper, and the Rev. C. Livingstone as general assistant.
2. The Council engage to furnish Dr. Livingstone with various suggestions concerning the observations to be made, and the best method of registering them.
3. That considering the well-known unhealthiness of the delta of the Zambesi below Tete, the Council earnestly recommend to Her Majesty's Government that Dr. Livingstone and his associates be forwarded (if practicable) from the mouth of the river to Tete in a *decked* steam vessel of light draught with as much celerity as possible, and that the steam-launch in preparation be employed solely for the navigation of the stream above Tete.

I have the honour to be,
My Lord,
Your Lordship's obedient servant,
(Signed) ROD. I. MURCHISON,
President Royal Geographical Society.

DR. LIVINGSTONE.—When I left the Makololo to go to Loando, I was in very much the same position that I find myself in now. I had been talking a great deal about the white man's country and about our ways to the Makololo, and a party of twenty-seven accompanied me to the west coast. When they came back, I said to my friends the Makololo, "Here are your own countrymen; let them speak; I intend to be silent now." I go out this time with several scientific gentlemen, and I hope, if it please God to spare us to return, to be able to say when we come back, "I will be silent; let them speak." I expect that Captain Bedingfeld will be able to give a good account of the river system of the country. We are not at all certain as to that wonderful net-work of waters to the northward of the parts that I traversed. That will be one point which we shall endeavour to ascertain. I have the greatest confidence that Captain Bedingfeld will give us accurate information on this point, and also as to the navigability of the Zambesi itself. I came down that river when it was full. I have no authority for what it may be at low-water. I take the authority of two or three naval officers who ascended seventy miles when it was at its lowest—sixteen feet below what I saw it at—and their opinion was favourable as to its navigability, and I hope Captain Bedingfeld's judgment will also be favourable. Then, Dr. Kirk is an economic botanist; he is expected to give us a full account of the vegetable resources of the country. From Mr. Thornton, of the School of Mines, we expect to get a full account of the mineral resources of the country, especially in relation to the coal-field, specimens of which I brought home with me. Then, we are accompanied by an artist, Mr. Baines, and my brother will also attend to photography, so that we hope to give you all an opportunity of seeing exactly what the sun tells upon collodion. Dr. Kirk being also a medical man, will be able to determine the value of my opinion respecting the healthiness of the high lands over which I passed, and their suitableness as a residence for Europeans. I would like you all to remember that the Zambesi is about the dividing point between the fertile country northwards, and the comparatively arid country to the south. In the north, and especially to the west, cotton abounds in large quantities. Fortunately, to-day, in packing up, I stumbled upon a piece of cotton which I carried all the way from Angola. In speaking to a gentleman at Manchester, I mentioned that this cotton was very short in the staple, about half an inch in length; but I find upon inspection that it is double that length, and is a valuable cotton. That cotton grows in Angola, and I believe the country to the north of the Zambesi is to a large extent admirably adapted to the cultivation of cotton. And, no doubt, there are many other products in that fertile country. I would also say with our Scotch poet Burns:—

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* *See* Proceedings, No. II., vol. ii., p. 82.—ED.

> "The best laid schemes o' mice, an' men,]
> Gang aft-a-gley."

There may be some little hitch; we may meet with some misfortune, with something we do not expect. But we mean to do our best, and we are determined to do our duty. And I would most gratefully thank the Geographical Society and its officers, and you, Mr. President, in particular, for all the kindness and all the honours that have been heaped upon me. I thank you most heartily, and I hope that I and my companions may be the means of introducing a new state of things into that hitherto down trodden country.

The PRESIDENT finally informed the Meeting that it had been resolved to give Dr. Livingstone a farewell public dinner on his departure on the 13th inst., and concluded by expressing the hope that many of his friends and admirers would attend.

Seventh Meeting, Monday, February 22nd, 1858.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Mr. T. W. Hinchliff and Mr. George Seymour were presented upon their election.*

ELECTIONS.—*Lieut, C. C. Gordon,* R.E.; *Capt. G. Hancock,* R.N.; *Sir*

Samuel M. Peto, Bart.; Edward Beldam; N. Bridges; J. H. and W. J. Browne; A. C. Gregory (late Commander North Australian Expedition); Wm. Gaussen; John Kirk, M.D.; *and P. L. Simmonds, Esqrs. were elected Fellows.*

AUDITORS.—*Thomas H. Brooking and E. Osborne Smith, Esqrs., on the part of the Council, and Thomas Lee and W. Foster White, Esqrs., on the part of the Society, were appointed Auditors.*

EXHIBITIONS.—*A bust, by Mr. Wyon, and photographs of Dr. Livingstone, by Claudet and Clarkington; instruments, by Casella, for the Livingstone Expedition, presented by the Society; and a Chinese Map of the World, presented by Mr. Lockhart, were exhibited at the meeting.*

The first Paper read was—

1. *On the Arru Islands.* By ALFRED R. WALLACE, F.R.G.S.

DURING a six months' residence in these islands (January to June, 1857) my movements were very limited, owing to a visit of the Magindanao pirates, who devastated some of the northern islands and the eastern coast, and struck such terror into the natives, that they could scarcely be induced to leave their homes. I, however, succeeded in reaching the eastern side of the main island by one of the curious channels which traverse it, and which I was most anxious to examine myself, as from the accounts of the traders I could make out nothing of their real nature. This journey, with some other excursions into the interior, has enabled me to understand the accounts I have received of the remaining portion, and obtain a general idea of the geography of this interesting group. The position of Dobbo, the Bugis trading village, has been determined by Captain Stanley, and the northern and southern limits are pretty well known by the observations of the Dutch and French exploring vessels; my remarks will, therefore, be principally confined to the physical features of the islands, which are in many respects highly interesting.

The Arru group may be said to consist of one very large central island with a number of smaller ones scattered around it. The great island is called by the natives and traders "Tanna busar" (great or main land), to distinguish it as a whole from any of the detached islands. It is of an irregular, oblong form, about 80 miles from north to south, and 50 from east to west, in which direction it is traversed by three channels or rivers dividing it into four portions. The northernmost of these, the river Watelai, I passed through, and found the entrance about 25 miles S.S.E. from Dobbo, in the southern angle of an extensive bay. The entrance is about a quarter of a mile wide, with low undulating land on each